

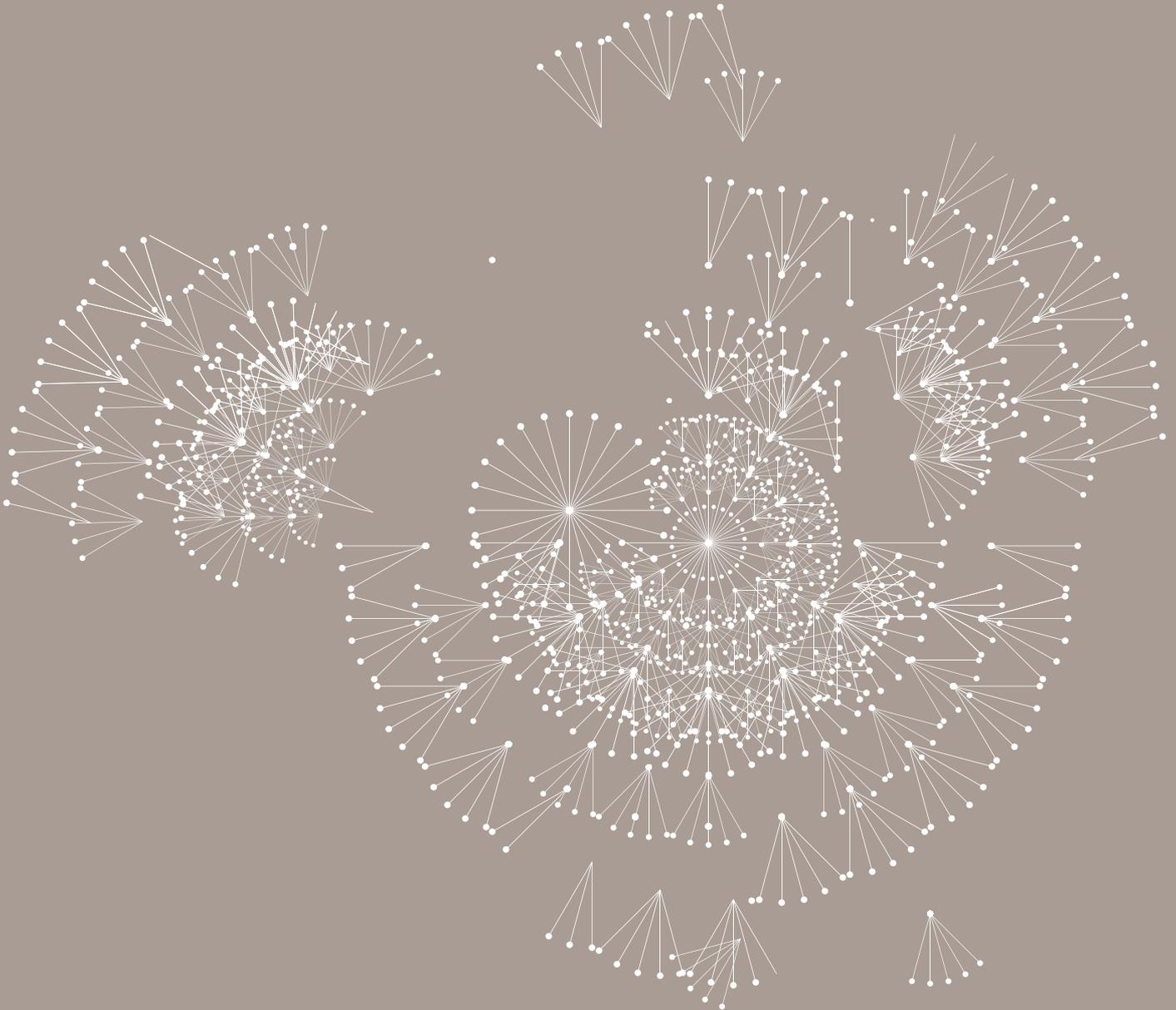
LEEDS SUSTAINABILITY INSTITUTE

International Sustainable Ecological Engineering Design for Society (SEEDS) Conference 2015

Abstracts



Leeds Sustainability
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Sustainable Ecological Engineering Design for Society
(SEEDS)

First International Conference

17 & 18 September 2015

Leeds Beckett University

United Kingdom

ABSTRACTS



International SEEDs Conference 2015: Sustainable Ecological Engineering Design for Society

2015 Conference Theme: Healthy, Energy Efficient Buildings and Spaces

The built environment has a greater impact on natural resources and produces more waste than any other industry. However, beyond the green rhetoric research is being applied on the ground to address the balance between the built and natural environment. The International SEEDs conference brings together experts from around the world focussing on the changes that are taking place and the benefits or consequences that are being predicted and measured regarding the built environment's impacts. As well as addressing technical issues, measuring energy efficiency and modelling energy performance, emphasis is placed on the health and wellbeing of the users of spaces occupied and enclosed. Understanding how buildings and spaces are designed and nurtured to obtain the optimal outcome is the focus of discussion and debate. This holistic approach draws together the research themes of energy, building performance and physics while placing health, wellbeing and ecology at the heart of the conference.

Through research and proven practice, the aim of the SEEDs conference is to foster ideas on how to reduce negative impacts on the environment while providing for the health and wellbeing of the society. The professions and fields of research required to ensure buildings meet user demands and provide healthy enclosures are many and diverse. The SEEDs conference addresses the interdependence of people, the built and natural environments, and recognises the interdisciplinary and international themes required to assemble the knowledge required for positive change.

The themes and topics covered by the papers include:

Building and environment design	Planning and sculpturing positive change
Energy efficient modelling, simulation and BIM	Reducing consumption and waste
Integrating urban and natural environment	Sustainability, ethics and responsibility
Building performance, analysis and evaluation	Occupant behavioural change
Thermal comfort, air quality and overheating	Community building and masterplanning
Green spaces, enclosures and buildings	Health benefits of alternative and natural materials
Green technologies and IT	Urban heat island and mitigation
Renewable energy	Building resilience
Energy flexible buildings	Sustainable cities
Energy behaviour and lifestyle	Zero energy and energy plus buildings
Dampness, water damage and flooding	Local producers and urban environments, edible
Building surveys, thermography, building pathology	Trees and green city landscape
Water quality	Designing edible urban landscapes
Air quality	

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The Leeds Sustainability Institute at Leeds Beckett University have hosted and supported this conference. Support has also been received from industrial partners, including, Saint-Gobain, ARC, and the Chartered Institute of Building, we are grateful for this support.

The Leeds Sustainability Institute is a centre of research, informed and supported by business leaders, professional associations and community groups. Our research addresses the challenges of creating more sustainable places, communities and economies. Through the Institute a wealth of experience and skill is captured, with the potential to influence and shape the future via its networks and partners.

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Development, Impact and Change

THERMALLY MODELLING BIO-COMPOSITES WITH RESPECT TO AN ORIENTATED INTERNAL STRUCTURE

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Keywords: Bio-composites, Image Analysis, Thermal Conductivity.

Abstract

To wean us from our destructive fossil fuel dependency we must produce buildings that are better in both their occupied energy use and their embodied energy content. Bio-composites formed from cellulose aggregates and binders have a low embodied energy and provide an excellent balance of insulation and thermal inertia; when used correctly they can produce efficient and healthy buildings with considerably lower embodied energy than traditional alternatives. These materials are however naturally variable depending on their production method and this has hindered their uptake in a culture of standardised, performance based codes. In order to gain wider use it is important that we can model their behaviour representatively.

An important, overlooked, factor in the behaviour of these materials is the internal structure on a macro scale, in particular the orientation and distribution of the aggregate. As the particles have a defined aspect and orientated structure themselves, the orientation of the particles within the composite may have a considerable influence on the hygrothermal properties. While this is a concept widely acknowledged, the internal structure of bio-composites has not been characterised or adequately incorporated into behavioural models.

This work implements a novel method of material characterisation based on digital image analysis to classify the internal structure of specimens of hemp-lime. The results indicate that the internal structure is highly anisotropic with strong directionality in the hemp particles governed by the construction process. A parameter corresponding to degree of directionality has been developed together with a thermal conductivity model based on a weighted average between bounding conditions.

Williams, J., Lawrence, M. and Walker, P. (2015) **Thermally modelling bio-composites with respect to an orientated internal structure** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

AN EFFECTIVE APPROACH FOR THE MANAGEMENT OF WASTE COFFEE GROUNDS

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Keywords: Resource Recovery, Sustainable Waste Management, Coffee, and Earthworms.

Abstract

In recent years the disposal of organic wastes from domestic, commercial, agricultural and industrial sources have caused concerns due to the environmental and economic problems associated with waste. The waste produced particularly in urban areas represents a huge cost for cities and a burden to the environment but, at the same time, represents an opportunity to take stock of valuable resources, which can be exploited. By boosting solutions to reduce waste and promoting its use as a resource the natural and living environment in urban areas can be enhanced. Cities are complex systems similar to living organisms that use energy, air, water and nutrients and need to dispose of waste in a sustainable way. By adopting an urban metabolism perspective cities can open the way for innovative and systematic approaches, which involve the analysis and use of resource-flows. Waste coffee grounds represent an under-utilised high nutrient material with potential to be exploited. Coffee is regarded as the highest consumed beverage in the developed world, and is the second most traded commodity in the world after oil. This paper will present research findings for an effective approach for the management of waste coffee grounds. This is achieved through examining an alternative approach of resource recovery and sustainable waste management practices for waste coffee grounds. It will also use a case study to examine the potential for waste coffee grounds to promote an ecological rethinking of nutrient flows.

Fletcher, I. (2015) **An effective approach for the management of waste coffee grounds** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

STRENGTH RELATED GEOTECHNICAL TESTING OF LATERITIC SOIL PRIOR TO THE APPLICATION OF MICROBIALLY INDUCED CALCITE PRECIPITATION TREATMENT

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Keywords: Lateritic soil modification, Microbially induced calcite precipitation, Rural earth road.

Abstract

Microbially induced calcite precipitation (MICP) is an emerging solution to issues faced by geotechnical engineers that has yet to turn its attention to strengthening fine particle clays, including lateritic soil. The lateritic clays found in tropical regions have long been used as a low cost construction material for earth roads linking rural village clusters. However, earth roads are exposed to prolonged tropical wet seasons and become inundated with rainwater, deteriorating their ability to bear traffic. MICP soil strengthening may provide a low cost, sustainable solution that would allow earth roads to remain usable.

This paper presents the first phase of geotechnical strength related tests undertaken on a lateritic soil, prior to any MICP treatment, including plasticity index, Proctor compaction, Californian bearing ratio (CBR) and unconfined compressive strength (UCS). They have been undertaken to provide the baseline data against which future MICP treated samples can be assessed.

The results indicate that the lateritic sample was a low plasticity clay, which may be prone to turbulent shearing when past its semi-solid/plastic limit of 12%. When tested at 12.5% moisture content, the values of CBR and UCS fell by 96.4 and 87.4% respectively when compared to samples tested at 7.5% moisture content.

Smith, A., Pritchard, M. and Edmonson, A. (2015) **The application of microbially induced calcite precipitation treatment** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

FEEDING A CITY: WHAT DO ACADEMIC RESEARCHERS THINK SHOULD BE ON THE URBAN FOOD SYSTEM'S PLATE

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Keywords: Urban, Food System, Food Security, Sustainable City.

Abstract

Developing a more sustainable urban food system is viewed as a route to tackling food insecurity, public health, and environmental challenges, and there has been significant re-engagement with the food system at the city scale in recent years. But to what extent do the factors currently being researched put us on a trajectory to delivering food systems that will function well in a changing future? This paper presents the findings of a review of urban food systems literature, exploring how the academic community understands and interacts with the urban food system, and to what extent existing approaches are effectively addressing the full range of urban food challenges. The review highlights a vibrant area of research with an exponential increase in contributions over the past decade. There are a number of subject areas that have received particularly strong focus and there is notable emphasis on the North American region. We identify that enquiry into local and alternative food systems is dominating the discourse and we critique the extent to which this addresses the full spectrum of challenges facing the urban food system.

Harris, J., Dougill, A. and Owen, A. (2015) **Feeding a city: what do academic researchers think should be on the urban food system's plate** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

Sustainable Buildings

EVALUATING NATURAL VENTILATION IN FUTURE CLIMATE SCENARIOS AS PART OF A LONG-TERM NON-DOMESTIC RETROFIT STRATEGY FOR AN EDUCATIONAL FACILITY

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Abstract

Natural ventilation is an established strategy that can help to reduce the energy consumption associated with conditioning buildings and weather conditions in the UK are suitable for the use of natural ventilation to help control summer overheating. However, there is now scientific consensus that anthropogenic emissions of carbon dioxide are leading to climate change and that global temperatures are set to increase as a result of this. It is likely that this will lead to longer and more intense summer heat waves. This paper presents a case study of a multi-use naturally ventilated university office building in the north of England. Dynamic thermal simulation software has been used to evaluate thermal conditions in the case study facility. Potential overheating using current weather files is compared to predicted overheating in future climate scenarios using morphed weather files. Results from this overheating analysis are then considered as part of a long-term retrofit strategy for the case study facility; this case study is used to demonstrate how this type of analysis can help to evaluate existing building performance and to inform investment-grade decision making.

Parker, J. (2015) **Evaluating natural ventilation in future climate scenarios as part of a long term non domestic retrofit strategy for an educational facility** *In*; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

QUANTIFYING THE EFFECT OF WINDOW OPENING ON THE MEASURED HEAT LOSS OF A TEST HOUSE

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Keywords: Heat loss measurement, window opening, air tightness, co-heating.

Abstract

Opening windows is a common method for controlling air temperature, moisture, air quality and odours in dwellings. Opening a window in winter will increase the heat loss from a house, the additional heat loss will depend on the size of the window opening and the length of time for which the window is open. However, window opening behaviour is unpredictable, varying widely between different dwellings and occupants making it difficult to incorporate into predictions of energy consumption.

This paper reports the results of an investigation to quantify the impact of window opening on the measured air tightness and total heat loss in a detached, timber framed test house built in the year 2000 to contemporary building standards, and located at Loughborough University. Blower door tests were used to measure the increase in ventilation caused by opening windows. The additional heat loss due to this ventilation was predicted using a simple model and then compared to the whole house heat loss as measured by a co-heating test. A linear relationship between window opening area and additional ventilation was found, independent of window location. This relationship was used to quantify the additional heat loss for a variety of window opening behaviours. The results show that window opening does not significantly increase heat loss rates in this particular house for all but the most extreme window opening behaviours. The implications of these results for different types of dwelling are discussed.

Jack, R., Loveday, D., Allinson, D. and Lomas, K. (2015) **Quantifying the effect of window opening on the measured heat loss of a test house** *In*; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

A SENSIBLE APPROACH TO LOW CARBON AND HEALTHY BUILDINGS

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Keywords: Life cycle analysis [FDES] LCA, home insulation, CO₂.

Abstract

House insulation reduces energy usage, lowering heating costs, and reducing CO₂ emissions. However insulating materials vary in the CO₂ emissions they produce in manufacturing, a fact consumers may not realise. Life Cycle Analysis (LCA) ascertains the CO₂ impact of manufactured goods allowing comparison. Here the results of LCA on a range of environmentally friendly insulators are presented. Natural Fibre Insulators (NFI's) are produced from natural or recycled products unlike conventional materials. How do these products compare in their overall CO₂ impact? What are the benefits of LCA and how comprehensive are they?

Garlovsky, D. (2015) **A sensible approach to low carbon and healthy buildings** *In*; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

ANALYSING THE TECHNICAL AND BEHAVIOURAL SHIFTS OF SOCIAL HOUSING TENANTS FOLLOWING THE RETROFITTING OF EXTERNAL WALL INSULATION

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Keywords: Behaviour Change, Retrofit, Sustainability.

Abstract

Environmental, economic and social issues present local housing associations with many challenges in terms of management of their existing housing stock. Multiple problems arise from poorly insulated properties, and the twin foci of this research regards the performance of residential external wall insulation, and identifying the additional benefits that External Wall Insulation (EWI) provides to social housing tenants, which are uncovered through means of behavioural and technical monitoring. The research process generated two sets of data points per household relating to the start and the end of the study and comparative analysis techniques are used to identify changes in user behaviours. Qualitative and quantitative data were collected using survey methods that explored environmental knowledge, attitudes, beliefs, and everyday behaviours with regard to energy consumption and use. Additional data capture involved temperature logging, meter reading, thermal imaging, and the analysis of energy meter readings to monitor changes in usage in the pre and post stages of retrofitting external wall insulation. The results of this study identify changes in the technical performance of the properties, and benefits in the well-being and behaviour of the tenants.

Lilley, S., Davidson, G., Gledson, B. and Alwan, Z. (2015) **Analysing the technical and behavioural shifts of social housing tenants following the retrofitting of external wall insulation** *In*; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

Energy and Sustainability

LEAN CONSTRUCTION AND SUSTAINABILITY: TOWARDS SYNERGETIC IMPLEMENTATION

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Keywords: Construction, Lean, Project, Sustainability.

Abstract

The synergy between lean and sustainability is marginally exploited in construction. To reverse this trend, this project that is at the preliminary stage is aimed at proposing a method for the co-generation of value with the simultaneous implementation of lean and sustainability in the construction industry. Although the planned research design is case-based because of objectivity and subjectivity reasons, this paper emerges from a structured review of the literature. The reviewed literature shows understandings of what constitute 'value' may be contributing to the status quo in this context. Instead of 'business-as-usual' view of value (economic), the concept of shared value may integrate lean and sustainability in construction. In general, further empirical work is needed to evolve methodical ways of focusing on this dimension of value in construction. The future work should endeavour to unravel: 'how and why' the concurrent implementations of lean construction and sustainability should evolve in the sector?

Emuza, F. (2015) **Lean construction and sustainability: towards synergetic implementation** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

ENERGY CONSUMPTION OF MOBILE PHONES

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Keywords: energy efficiency, Windows Phone, smartphone's energy consumption.

Abstract

Battery consumption in mobile applications development is a very important aspect and has to be considered by all the developers in their applications. This study will present an analysis of different relevant concepts and parameters that may have an impact on energy consumption of Windows Phone applications. This operating system was chosen because limited research related thereto has been conducted, even though there are related studies for Android and iOS operating systems. Furthermore, another reason is the increasing number of Windows Phone users. The objective of this research is to categorise the energy consumption parameters (e.g. use of one thread or several threads for the same output). The result for each group of experiments will be analysed and a rule will be derived. The set of derived rules will serve as a guide for developers who intend to develop energy efficient Windows Phone applications. For each experiment, one application is created for each concept and the results are presented in two ways; a table and a chart. The table presents the duration of the experiment, the battery consumed in the experiment, the expected battery lifetime, and the energy consumption, while the charts display the energy distribution based on the main threads: UI thread, application thread, and network thread.

Vasile, C., Pattinson, C. and Kor, A. (2015) **Energy consumption of mobile phones** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

FIELD NOTES FROM A COMBINED SOLAR RECHARGING HUB AND COMMUNITY WATER POINT IN THE GAMBIA: HOW SUSTAINABLE TECHNOLOGY CAN IMPROVE LIVELIHOODS IN PERI-URBAN AND RURAL GAMBIA

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Keywords: Gambia, sustainable technology, community energy, rural livelihoods, off grid electricity.

Abstract

Access to mobile phones in Sub-Saharan Africa has increased sharply in recent years and has brought opportunities both to connect to loved ones and to access information, for example gathering information e.g. regarding agricultural markets and public services. The latter is particularly significant where other information sources such as newspapers and television are not widely available. This recent growth rate has corresponded with decreasing mobile phone costs. Interestingly, many households have access to mobile masts before they have access to infrastructure such as health services, all weather roads, electricity or clean water i.e. they live off grid and are often prepared to travel significant distances to recharge their phones even though this means they use disproportionate resources of time and money to do so (Manchester and Swan, 2013). Swan and Cooper (2013) found that people had been prepared to travel up to 2km in Malawi to charge their phones and in the area of our project site people had previously travelled up to 4.5km.

*The past five years have seen the emergence of a range of novel solutions for recharging cell phone batteries across different parts of Africa (Swan and Cooper, *ibid*). The impact is potentially greatest in rural areas which have generally not had access to telecommunications previously. However, their use may be hindered by lack of access to electricity to keep phones charged. Electricity is acknowledged as a key driver of economic growth and yet in Sub-Saharan Africa only 30% have electricity and in rural areas the figure is 14%. Many rural communities also lack access to safe water in sufficient quantities to maintain health and to create livelihood opportunities.*

Access to information via mobile phones and to an improved and secure water supply creates various opportunities for peri-urban and rural smallholders to enhance their income and develop further small enterprises to enhance their livelihood security. This paper discusses the early impact of access to mobile phone recharging facilities and a community water supply in a peri-urban community in the Gambia with reference to the communities' perceptions of their possibilities to derive more secure livelihoods from these services. This is a new community facility and the intention is to study its impact over time.

Kenny, O., Logan, I., Swan, A. and West, J.(2015) **Field notes from a combined solar recharging hub and community water point in the Gambia: how sustainable technology can improve livelihoods in peri-urban and rural Gambia** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

AN EVALUATION OF THERMAL AND LIGHTING PERFORMANCE WITHIN AN ETFE STRUCTURE

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Keywords: ETFE Structures, Thermal Evaluation, Lighting Performance, Building Performance.

Abstract

This paper reports on a study into the thermal and lighting environment of an enclosed Ethylene Tetrafluoroethylene (ETFE) foil-covered structure. This is based on the on-site monitoring over set periods of time in summer 2014 and winter 2015. ETFE-foil is a relatively new highly-translucent construction material that has been used in some high profile projects around the world.

In a unique development, this project looked at a new building product that makes use ETFE film and tensioned it over aluminium frames to create a modular ETFE-covered panel that can look similar to and can be installed as a replacement for glazing. This opens up new markets for the use of ETFE-film, such as agriculture and horticulture, and allows for possibilities such as urban and vertical farming or the retrofitting of existing commercial and residential greenhouses.

A test structure was constructed from the ETFE-covered panels. This paper will report on the impacts of solar radiation on the thermal environment as well as the relative humidity within this enclosure so that a more holistic understanding of the thermal comfort can be obtained. The second section will explore the internal daylighting environment including analysis of the daylight factor within the structure and luminance mapping to examine brightness and visual performance and its effect on the perception of space and objects within. The paper will conclude that the temperature within the enclosed ETFE structure can become too high during the summer months and may require heating when occupied during the winter months. The research also finds that the daylight levels can be too bright if the internal space were to be used regularly by occupants, although this may be beneficial for plants. In both cases, overheating and solar gain issues can be resolved through appropriate shading and ventilation.

Martin, B., Masih, D., Lau, B., Beccarelli, P. and Chilton, J. (2015) **An evaluation of thermal and lighting performance within an ETFE structure** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

Impact, Health and Environment

NHS ASSET RECONFIGURATION WITH SPECIFIC REFERENCE TO FUNCTIONAL USE AND PATIENT PATHWAYS: A SUSTAINABLE APPROACH TO ASSET MANAGEMENT

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Keywords: Assets, Patient-Pathway, Reconfiguration, Integration, NHS.

Abstract

The NHS has evolved into a system that is renowned for being one of the most comprehensive domestic healthcare providers in the world. However, the size and complexity can challenge its ability to offer an integrated health care service that many perceive it should.

The implications of delivering such a sizable and complex system also means that it is one of the UK's largest financial burdens as well as a key UK asset. However, critics have raised concern with regard to the ability of the health service to develop an integrated patient pathway. One particular challenge is to capture and understand the needs of patients and to effectively align clinical services. To meet patient needs effectively, without unduly placing additional burden on the country, requires resources to be aligned. At the moment it is suggested that the physical assets are not effectively utilised and in some cases unable to meet practitioner and patient needs.

By case study method, this paper presents a proposal for research which seeks to identify requirements and map the resources and use of physical assets to meet the patient and practitioner needs. The specific focus of the research will identify reconfiguration factors and reasons for under-utilisation. Through review and expert feedback a more effective asset model will be proposed and validated. This paper provides a review of methods used to assess the NHS building stock and offers a model for critical feedback and further development.

Redmond, K. and Gorse, C. (2015) **NHS asset reconfiguration with specific reference to functional use and patient pathways: a sustainable approach to asset management** *In*; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

MODELLING THE DELIVERY OF RESIDENTIAL THERMAL COMFORT AND ENERGY SAVINGS: COMPARING HOW OCCUPANCY TYPE AFFECTS THE SUCCESS OF ENERGY EFFICIENCY MEASURES

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Keywords: Building Energy Simulation Modelling, Energy efficiency measures, Occupancy, Thermal comfort.

Abstract

There is a significant challenge in residential energy efficiency retrofit. Typically, people are incorporated in building modelling work through the standardised occupancy pattern of a typical household. However, there is strong evidence to show that the influence of individual users on domestic energy use is significant. The purpose of this work is to enhance building energy modelling capabilities by incorporating insight into how occupants live in their homes and considering the effectiveness with which heating systems deliver thermal comfort. Energy efficiency measures of thermal insulation and heating controls are compared for three distinct household occupancy patterns; working family, working couple and daytime-present couple. These are compared based on heating energy demand savings and on how well they can deliver thermal comfort using a novel factor, the Heating Comfort Gap, HCG. The model uses engineering building modelling software TRNSYS. The results from this modelling work show that successful reductions in energy consumption depend on the appropriate matching between energy efficiency measures and occupancy type. This work will help to improve the accuracy of calculations of energy savings in peoples' homes which could have significant benefits for policies such as the UK's Green Deal. It could also progress the tools available for giving tailored advice on how best residential energy use can be reduced.

Marshall, E., Steinberger, J., Foxon, T. and Dupont, V. (2015) **Modelling the delivery of residential thermal comfort and energy savings: comparing how occupancy type affects the success of energy efficiency measures** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

URBAN LOCAL FOOD PRODUCTION – THE ROLE OF ALLOTMENTS?

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Leeds, LS2 8AG, United Kingdom

Keywords: Local food policy, urban farming, community gardens, allotments, sustainable food production.

Abstract

There is renewed interest in local food production in cities deriving from concerns about urban sustainability, food security and related issues. Much academic and policy attention is evident, with particular interest shown in community gardening and similar local collective food projects. In this paper we argue that the well-established allotments system is often undervalued and deserves more attention than it is receiving within local food strategy discourses. Allotments play an important role in the local food cycles of many European cities including the UK. This paper examines what role allotments play in meeting urban food needs and considers how they might be better supported. Interviews conducted with allotment activists help provide some perspective on how the allotment infrastructure could grow and flourish.

Dickinson, I. and Thomas, K. (2015) **Urban local food production – the role of allotments?** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

AN INVESTIGATION INTO BUILDING PHYSICS IN THE FIELD AND THE TESTS USED TO CHARACTERISE BUILDING PERFORMANCE

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Keywords: Building performance, assessment, methods, and energy.

Abstract

According to the Energy Information Administration (EIA, 2013), the consumption of world energy is predicted to rise by 56% from 2010 to 2040. International Energy Outlook 2013 suggests that the factors responsible for this increase are rapid economic progression and increasing population (EIA, 2013). According to Eichholtz et al. (2010), the building industry accounted for 35-40% of the world energy consumption, and stakeholders in this sector have placed sustainability high on their list of objectives.

Referring to the '67 Temple Avenue house' case study, findings revealed that only 71% of the predicted reduction in heat loss was achieved (Miles-Shenton et al., 2010; Miles-Shenton et al., 2011). These disparities between the modelling assumptions and construction techniques used in this project could however be questioned on reliability grounds in order to rectify the possible disparities. It is important to ensure that buildings are designed from the onset to minimise environmental impact throughout the building life cycle including actual operational performance and energy use reduction. For this reason, there is the need to assess the performance of the building in context, and the need to close the gap. Therefore, this paper focuses on identifying the gap and evaluating the accuracy of methods used to assess building performance.

Akinrinola, O. and Gorse, C. (2015) **Off the shelf solutions to the retrofit challenge: thermal performance and comfort** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

Sustainable Initiatives

SUSTAINABLE COASTLINES -THE CASE OF THE GAZA STRIP

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Keywords: Beach Litter, Coastline, Gaza Strip and Sustainability.

Abstract

Sustainable development is not possible without safeguards to maintain a healthy, clean and productive natural environment. In particular, ocean and coastal ecosystems play a central role in shaping the earth's climate and supporting both biodiversity and economy. The issue of beach litter is critically contributing to beach degradation which has adverse effects on marine life and beach users. Explicitly, the Gaza Strip Coastline is subjected to extensive illegal dumping operations of beach litter. This problem is posing a threat to both marine life and people in the Gaza Strip. Furthermore, it has direct implications on the future prospect of sustainable development of the local population. Although beach litter has received worldwide increasing attention in recent years, few studies have explored this phenomenon across the Gaza Strip Coastline. One significant barrier to enforcing a mitigating approach to Beach Litter in the Gaza Strip is the lack of a reliable science-based data. Addressing Beach Litter within the context presented, this research will fill the current scientific gap of different aspects associated with Beach Litter in the area. Specific information on the sources, composition and quantities of generated beach litter were presented in this study. In addition, the perception of beach users on aspects related to beach litter was investigated. Results presented in this research map the first step along the path of sustainably managing the Gaza Strip Coastline.

Hamouda, H., Abu-Shaaban, Nadine. and Al-Swaity, E. (2015) **Sustainable coastlines – the case of The Gaza Strip** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

GREEN SERVICE LEVEL AGREEMENT

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Keywords: SLA, Green IT, Sustainability, IT ethics.

Abstract

Nowadays, when most businesses are moving forward to sustainability by providing or getting different services from different vendors, Service Level Agreement (SLA) becomes very important for both the business providers/vendors and for users/customers. There are many ways to inform users/customers about various services with the inherent execution functionalities and even non-functional/Quality of Service (QoS) aspects through SLAs. However, these basic SLA actually did not cover eco-efficient green issues or IT ethics issues for sustainability. That is why Green SLA (GSLA) should come into play. Green SLA is a formal agreement incorporating all the traditional commitments as well as green issues and ethics issues in IT business sectors. GSLA research would survey on different basic SLA parameters for various services such as network, compute, storage and multimedia in IT business areas. At the same time, this survey would focus on finding the gaps and incorporation of these basic SLA parameters with existing green issues for all these mentioned services. Finally, this research would also focus on the integration of green parameters in existing SLAs, defining GSLA with new green performance indicators and their measurable units. This proposed GSLA could help and clarify different service providers/vendors to design their future business strategy in this new transitional, sustainable society.

Ahmed, I., Klimova, A., Rondeau, E. and Rybin, A. (2015) **Green service level agreement** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

ANALYZING THE PAYBACK TIME OF INVESTMENTS IN BUILDING AUTOMATION

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Keywords: energy saving, building automation, return on investment and payback time.

Abstract

Smart home implementation in residential buildings promises to optimize energy usage and save significant amount of energy because of a better understanding of user's energy usage profile. Apart from the energy optimisation prospects of this technology, it also aims to guarantee occupants comfort and remote control over home appliances both at home locations and at remote places. However, smart home spending requires an adequate measurement and justification of the economic gains it could proffer before its realization. These economic gains could differ for different occupants due to their inherent behaviours and tendencies. Thus it is pertinent to investigate the various behaviours and tendencies of occupants for similar domain of interest and to measure the value of the energy savings accrued by smart home implementations in this domains of interest in order to justify such economic gains. This paper investigates the energy consumption in rented apartments for two behavioural tendencies (Finland and Germany) obtained through observation and corroborated by conducted interviews. These tendencies alongside the energy measurements from the smart home system is used to measure the payback time and Return on Investment (ROI) of their smart home implementations. The research finding reveals that building automation for the Finnish behavioural tendencies seems to proffers a better ROI and payback time due to a relatively higher energy usage for space heating during the dark winter times.

Sangogboye, F., Droegehorn, O. and Porras, J. (2015) **Analyzing the payback time of investments in building automation** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

A NEW EXPERIMENT AND MODELLING WORK TO JOINTLY IDENTIFY THE BUILDING ENVELOPE'S THERMAL PARAMETERS AND A PHYSICAL SOLAR APERTURE

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Keywords: co-heating test, control, dynamic sequence, grey-box model, on-site measurement, solar aperture, solar pre-processor, thermal performance.

Abstract

Co-heating tests have been used by many researchers for the characterisation of the heat loss coefficient (HLC) of building envelopes. Measurements may be analysed through static, transient or dynamic approaches. A reliable identification of the HLC is obtained by the joint identification of multiple parameters, including the solar aperture. The solar gains continuously depend on the relative position of the sun with regard to the building's glazed components and on the type of emitted radiation, ranging from diffuse (overcast sky) to beam (clear sky). However in state-of-the-art static coheating tests, only the daily mean solar radiation is analysed, leading to the identification of a static solar aperture (A_w). Practitioners then have to rely on several weeks of continuous measurements under representative but not extreme weather conditions to derive regression lines with acceptable correlation coefficients between the daily means of the measured variables. Finally, the obtained results do not allow performing dynamic predictions since the model is static.

This paper first explains the advantages of the newly developed experimental protocol itself, compared to other dynamic tests recently applied in situ. It also presents a new methodology to better take the solar gains into account during the dynamic analysis of a short experiment. The proposed methodology jointly enables a more accurate identification of the general heat loss characteristics of the building and of a physically-interpretable and climate-independent solar aperture. It can be seen as the equivalent total solar transmission coefficient of the envelope under normal incidence, multiplied by the total glazed surface of the whole building envelope, and is denoted as $gA_{eq,tot,\perp}$ (replaces A_w).

The proposed method can be applied to characterize the static energy performance of the building and also to predict (or even control) the energy consumption under specific weather forecasts or normalized conditions.

Lethé, G. (2015) **A new experiment and modelling work to jointly identify the building envelope's thermal parameters and a physical solar aperture** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

Sustainable Resources and Policy

DEVELOPMENT OF SUSTAINABLE DRINKING WATER QUALITY SOLUTIONS FOR RURAL COMMUNITIES IN THE DEVELOPING WORLD

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Keywords: Developing world, drinking water quality, *Moringa oleifera*, shallow wells.

Abstract

In developed countries potable water is usually taken for granted, where advanced infrastructure and a strong economy has allowed waterborne diseases (such as cholera and dysentery) to be virtually eradicated. In contrast, developing countries have poor infrastructure, lack development, stability and vibrancy. Consuming untreated, and potentially contaminated, groundwater extracted from shallow wells is the only option.

The primary aim of this study was to undertake an extensive field water quality-sampling programme in rural villages throughout Malawi. About 95% of all the wells tested failed to meet safe drinking water values for untreated water in the wet season, while about 80% of the wells failed in the dry season. The main forms of contamination emanate from bacteriological and physical constituents. As noted in the United Nations post-2015 water agenda, water quality is just as important as water quantity – the two are inextricably linked. Hence, there is currently a great need to develop more appropriate, cost-effective options to treat water; particularly to reduce the 3.5 million deaths related to inadequate water supply and sanitation each year.

*Subsequently the aim was directed towards investigating a sustainable, yet appropriate, way to treat shallow well water to significantly improve quality. The most suitable method to remove coliforms and turbidity from water is via the process of coagulation, using aluminium sulphate (alum) or ferric sulphate (ferric). The limited availability and relative expense of these chemicals has led to other more appropriate indigenous coagulants being sought for developing countries. Natural plant extracts have been available for water purification for many centuries. However, the science and engineering application of the use of plant extracts have not really been developed. To start to address this, Leeds Beckett University and the University of Malawi - The Polytechnic have shown that a locally available plant extract, *Moringa oleifera*, which grows wild throughout rural villages in developing countries, can be used to improve water quality in the order of 80–94%. The flocculent capacity of *M. oleifera* is closely comparable to that of a well-established chemical coagulant, alum.*

Pritchard, M., Edmondson, A., Craven, T. and Mkandawire, T. (2015) **Development of sustainable drinking water quality solutions for rural communities in the developing world** *In*; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

THE PATCHWORK POLITICS OF SUSTAINABLE COMMUNITIES

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Keywords: sustainable communities, neighbourhood planning, inequality.

Abstract

The aim of this paper is to review government strategies for sustainable communities in England and particularly the programme of neighbourhood planning introduced from 2011 in which responsibility for achieving sustainable development was devolved to local communities. It explores the definition of sustainability that emerged from these neighbourhood plans, one in which the priorities of environmental quality and the welfare needs of social reproduction were constrained through a choice of economic growth or self-reliance. The paper reports on research with urban and rural communities seeking sustainability through neighbourhood planning and it reveals the starkly unequal geography of sustainable development that is emerging. The paper concludes that hopes of sustainability in England are now heavily dependent on the geographical whims of the property market.

Bradley, Q. (2015) **The patchwork politics of sustainable communities** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

WHAT HAS POSTERITY EVER DONE FOR US? AN ETHICAL FRAMEWORK FOR UK CLIMATE CHANGE POLICY

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Keywords: Sustainability, ethics, climate change, Stern Review.

Abstract

The Stern Review provides the rationale for UK climate change policy. The paper analyses the ethical basis of the Review and evaluates other ethical frameworks that challenge the Review's agent-neutral perspective. A rights-based approach to the interests of future generations is found wanting but an agent-relative approach is shown to provide a valid alternative to the orthodox approach exemplified by Stern. An agent-relative approach to fulfilling our obligations to future generations that recognises the notion of empathic distance is proposed as a way of balancing the interests of those alive now with the interests of posterity.

Bradley, J. (2015) **What has posterity ever done for us? An ethical framework for UK climate change policy** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

MANAGEMENT OF WATER RESOURCES IN THE AMAZON REGION

Environmental and social damages and economic compensation for the existence of Dams: a cost benefit analysis of hydroelectric plants (a comparison between Tucuruí and Belo Monte)

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Keywords: Amazon Region, Belo Monte, Brazil, Cost Benefit Analysis (CBA), Hydroelectric, Tucuruí, Water.

Abstract

Brazil has an energy matrix which is based on 45% of renewable sources, and more than 70% of this electricity is drawn from hydroelectric plants. The present work tries to show how big hydroelectric projects, even if it is globally acknowledged as clean, can hide several threats for both humans and the environment. With this aim, the analytical tool of Cost-Benefit Analysis (CBA) has been applied on two hydroelectric projects: the Tucuruí dam (already in operation - attempting to simulate an ex-ante analysis but using actual data) and the Belo Monte dam (not yet fully operating - using forecasts). The evaluation of the feasibility of both these projects is obtained by calculating the ENPV (Economic Net Present Value) and the B/C Ratio (Benefits to Costs Ratio). Then subsequent arguments are proposed as to why a technical and quantitative comparison of these projects is difficult to implement in practice, due to uncertainties as to which SDRs (Social Discount Rates) should be applied or upon which distinct

Caravaggio, N. and Iorio, M. (2015) **Management of water resources in the amazon region** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

Education

EFFECTIVE WEB-BASED ENGINEERING AND TECHNOLOGY CURRICULUM FOR RURAL HIGH SCHOOLS

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Keywords: Web-based, curriculum, online, quality, effective, rural, engineering, technology, high school, secondary education.

Abstract

Rural high schools have traditionally lacked access to the most up-to-date engineering and technology curriculum and teaching resources. Recently, the use of communication technology has allowed improved access to engineering and technology teaching and learning resources where they would otherwise not be available. With relatively standard technology and limited travel requirements, recent developments have enabled changes to curriculum delivery that should not only provide materials but significantly improve the teaching and learning experience. However, the effectiveness of these new media and teaching practices at improving learning outcomes remains an unanswered question.

In order to evaluate the effectiveness of a novel, web-based technology education program, Southern Utah University developed a pilot, the Technology Intensive Concurrent Enrollment (TICE) 1010 course. The course, initially taught to 23 students at Gunnison High School, was implemented Fall Semester 2013. There were three main objectives to the pilot program. The first objective was to test the newly developed curriculum. The second objective was to evaluate synchronous team teaching to a rural high school using video conferencing software. The third objective was to determine if the delivery of the curriculum was effective from the students, instructors and stakeholders' perspective.

"A Guide to Quality in Online Learning" (Butcher & Wilson-Strydom, 2012) was used as the curriculum developmental framework. Quality Matters (QM) provided scoring rubric and pedagogic theory. Additionally, both "Double Loop Learning" (Batista, 2006) and "Online Community of Inquiry theory" (Garrison, 2007) influenced the pedagogic approach.

The pilot program was evaluated using a peer review, with critique and incremental observation provided by students, instructors and stakeholders (administrators). The triple perspective from students, educators and administrators helped to triangulate and broadly measure what was considered effective and where further development was needed. The instruments and processes used to collect the data are presented and discussed, as are the initial analysis and results.

The information in this paper will provide the background and context to the research process and a review of the literature. It will also discuss how the literature was applied to develop the web-based curriculum, and will provide a brief insight into the data collected from the pilot courses. Next, the existing literature will be compared to the data that was collected. The last part of this paper will be used to discuss the future direction of the TICE program.

Cozzens, R. (2015) **Effective web-based engineering and technology curriculum for rural high schools** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

SUSTAINABLE EDUCATIONAL INFRASTRUCTURE IN COLOMBIA AS TRANSFORMING SOCIETY TOOL: ROCHESTER SCHOOL STUDY CASE

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Keywords: LEED, green school, sustainable curriculum.

Abstract

LEED consultancy for Rochester School (K-12 private school) evaluated and integrated multiple sustainable strategies, which led it to achieve the 2014 LEED Gold as the first certified school in Colombia and first Gold level in Latin America.

Colombia has been adopting green building as “marketing strategy” to promote sustainable practices into the building sector. Green schools as educational facilities aim to be used as educational living text books.

Based on sustainable strategies, Rochester School has been implementing a “sustainable integrated curriculum” using infrastructure as a main “living study text”. Strategies such as water treatment are used for science lessons; landscape integrating artificial reservoir and native vegetation on a natural corridor are used to foster fauna biodiversity; there’s also a “Rochester bird guideline” as an integrated project.

An organic recycling program is based on composting to support native-tree orchards. This program is the main resource for Chia Municipality reforestation program. Guided by teachers, students from kindergarten to middle school are in charge of growth and crop; high school students, parents, staff and volunteers from Chia lead reforestation activities.

Rochester school has been recognized by national and international organizations such as Kimberly Clark Foundation – Ekco-Awards recognition for Exceptional Places to Work in 2013, BIBO-WWF in 2014 as “Academy – Best Environmental Practices”, “Green Project Challenge - 2014” first place. Since 2012 Rochester School is leading “Green Apple Day” in Colombia and “Our Choice”, an integrative K-12 networking initiative based on sustainability educational strategies for schools since 2014.

Campos, L. (2015) **Sustainable educational infrastructure in Colombia as transforming society tool: Rochester School study case** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

ERASMUS MUNDUS IN PERCCOM: EDUCATION FOR GREEN INDUSTRY

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Keywords: Education, Green ICT, Sustainability, International program.

Abstract

Today environmental safety, green energy, and ecological engineering becomes a top priority as a result of negative impact of human activities on the environment, current rates of industrial development and globalization. Higher education sector has a responsibility to those challenges as a key player in the successful transition to a knowledge-based economy and society. The problems, which the society is facing today, could be mitigated by training highly qualified professionals with expertise in green information and communication technologies.

International Erasmus Mundus Master Program in Pervasive Computing and Communications for Sustainable Development (PERCCOM) aims at combining advanced information and communication technologies with environmental awareness. This program provides unique competences for ICT professionals who will be able to build cleaner, greener, more resource and energy efficient cyber-physical systems.

This paper defines a cross-disciplinary approach of master degree program in green ICT. The method used for defining the pedagogic program content focuses on competences in order to ensure sustainability of the program in terms of employability.

The paper provides a feedback from students, which demonstrates program evaluation results and emphasis issues that need to be improved.

This paper covers such aspects as training in the development of tools and software for sustainable development, as well as educating open-minded professionals familiar with international research environment.

Kilmova, A., Andersson, K., Porras, J., Rondeau, E., Rybin, A. and Zaslavsky, A. (2015) **Erasmus mundus in PERCCOM: education for green industry** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

A WEB-BASED ENVIRONMENTAL TOOLKIT TO SUPPORT SMES IN THE IMPLEMENTATION OF AN ENVIRONMENTAL MANAGEMENT SYSTEM

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Keywords: Environmental management system, Environmental toolkit, Small and medium-sized enterprises, IT for greening.

Abstract

With small and medium sized-enterprises (SMEs) taking up the majority of the global businesses, it is important they act in an environmentally responsible manner. Environmental management systems (EMS) help companies evaluate and improve their environmental impact but they often require human, financial, and temporary resources that not all SMEs can afford. This research encompasses interviews with representatives of two small enterprises in Germany to provide insights into their understanding, and knowledge of an EMS and how they perceive their responsibility towards the environment. Furthermore, it presents a toolkit created especially for small and medium-sized enterprises. It serves as a simplified version of an EMS based on the ISO 14001 standard and is evaluated by target users and appropriate representatives. Some of the findings are: while open to the idea of improving their environmental impact, SMEs do not always feel it is their responsibility to do so; they seem to lack the means to fully implement an EMS. The developed toolkit is considered useful and usable and recommendations are drawn for its future enhancement.

Schmidt, M., Pattinson, C. and Kor, A. (2015) **A web based environmental toolkin to support SMEs in the implementation of an environmental management system** *In*; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

Monitoring Survey and Assessment

A CASE STUDY OF THE METRICS OF CAPTURING THE 'GREEN' IMPROVEMENTS ON A NEW OFFICE BUILDING

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Keywords: Green, environment, metrics, operational savings, Post Occupancy Evaluation.

Abstract

In 2014 Skanska sponsored a WGBC report; 'Health, Wellbeing, and Productivity in Offices; a new chapter for green building'. This proposes a framework of metrics for monitoring green building performance relating to the physical environment, employee perceptions, and financial costs/ benefits of variation in occupant health and wellbeing as a result of occupying green office buildings.

This paper sets out a methodology in a case study of a recently constructed Skanska office in Bentley (Yorkshire) called Neelands House, where these metrics are being applied in a state-of-the art green facility. This will provide before and after comparisons of how the old/ new buildings affect employees, as well as a form of web based Post Occupancy Evaluation (POE) which could begin to change the way investors approach green refurbishment opportunities. This paper sets out the methodology adopted, lessons learned, and outputs from the initial occupant surveys, however this research process is ongoing, with the first conclusions on financial and physical metrics to be drawn 18 months post occupancy in the summer of 2016.

Skanska are active in the refurbishment market in the UK, demonstrated through their presence on public procurement frameworks for EPC such as RE:FIT, Essentia, and CEF, as well as having carried out green refurbishments to a number of their own offices.

A major deterrent for green build/refurbishment appears to be poor understanding of how to deliver projects successfully post-implementation through adopting the necessary operational procedures. Concepts such as the performance gap, and perceived poor ROIs make investment unattractive and a lack of understanding on how best to operate and evaluate sustainable buildings in use, are slowing uptake.

The business case for green build/refurbishment is primarily based on operational savings. While significant, these only account for a fraction of an organisations ongoing costs, and the case for investment is far from compelling. Decision makers for Green interventions are not increasing uptake rates as quickly as desirable.

We see a need to lead in this area, and are now applying this framework of metrics to Skanska's own office buildings in order to develop the methodology further.

Pottage, C. and Jeffrey, H. (2015) **A case study of the metrics of capturing the 'green' improvements on a new office building** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

BUILDING SURVEYS TO INFORM ASSESSMENT OF INITIAL CONDITIONS IN A PROPERTY PRIOR TO THERMAL UPGRADE

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Keywords: Building surveys, thermal upgrade.

Abstract

Building surveys of existing properties can be useful when considering thermal upgrade. One aspect of the performance gap, when thermally refurbishing an existing property, is a miscalculation of its performance prior to intervention. If better than expected and the performance following intervention is worse, then gains and pay-back periods will be unfavourably affected. Additionally, some individual aspects may be identified which preclude certain design decisions.

To assess the performance there are four levels of inspection: a desktop assumption, a brief visual visit, a short condition assessment, and a full building survey with initial performance testing taking some hours or even days to determine actual construction and performance rather than theoretical. One prerequisite assumption for thermal upgrade design is that the property construction and condition is known to the extent of the fourth level of survey, whereas in practice, only a desktop assumption or brief visual inspection may have been made. Resources of time, money and size of estate are usually restricting factors on the level of survey undertaken.

The requirements of an initial survey have been explored. This would determine where the construction, materials, and condition of the property may impact on its pre-works performance and where these may adversely affect its performance following the thermal improvement. Specific reference is made to moisture levels in the construction. Standard levels of survey are compared and assessed against the information required for effective thermal improvement. A protocol for an initial survey assessment of a property's construction, condition and performance is offered.

Smith, M. (2015) **Building surveys to inform assessment of initial conditions in a property prior to thermal upgrade** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

A METHODOLOGY FOR IDENTIFYING GAPS BETWEEN MODELLED AND MEASURED ENERGY PERFORMANCE IN NEW-BUILD SOCIAL HOUSING

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Keywords: Social Housing, Thermal Performance, Dynamic Thermal Simulation, Resilient Construction.

ABSTRACT

Registered social landlords (RSLs) that deliver new-build housing have a vested interest in providing energy efficient, thermally effective dwellings. The methodology presented in this short paper focuses on a new-build programme that is delivered by an RSL's own Direct Labour Organisation (DLO). This allows for much closer control of site operations to help ensure that design intent is met as closely as possible. Due to RSLs retaining ownership of the new-build dwellings throughout their life-cycle, it offers them a unique opportunity to complete long-term monitoring of building energy performance. A methodology is described in this paper for an RSL to become an informed client with the ability to evaluate the energy performance of proposed designs, assure quality standards on site and measure the long-term energy use and thermal performance of new-build social housing. As part of this methodology, designs will be evaluated using dynamic thermal simulation (DTS) software which will provide a more detailed prediction of energy performance than regulatory compliance calculations. These predictions will then be compared with in-use monitoring data. Collectively, this data and analysis will allow them to identify gaps in performance and help them to define processes that can mitigate these in future projects.

Knera, A., Parker, J. and Poxon, A. (2015) **A methodology for identifying gaps between modelled and measured energy performance in new build social housing** *In*; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

DOUBLE SKIN FAÇADES FOR THE SUSTAINABLE REFURBISHMENT OF NON-DOMESTIC BUILDINGS: A LIFE CYCLE ENVIRONMENTAL IMPACT PERSPECTIVE

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Keywords: Double Skin Façade, Life Cycle Assessment, Low-carbon Refurbishments, Office Refurbishment.

Abstract

In developed countries, existing buildings have the biggest share in the building stock. Given the age of construction, the property vs. land values, and their slow replacement rate, low-carbon refurbishments are arguably one of the most sensible ways to mitigate environmental impacts (EIs) in the construction sector and meet the greenhouse gas (GHG) reduction targets. In this respect, Double Skin Façade (DSF) has been defined as one of the most effective ways to efficiently manage interactions between outdoors and indoors, and its benefits span from passive heating and cooling to the enhancement of thermal comfort of the occupied spaces. A plethora of research does exist on the operational behaviour of the DSF. However, life cycle energy figures and EIs are yet to be established fully and comprehensively. This paper reports on findings of an on-going research project aimed at filling such a gap. More specifically, life cycle assessment (LCA) and building energy modelling (BEM) have been combined to build a methodology to help assess life cycle energy figures in a more holistic manner. Primary data has been collected from manufacturers from across Europe about all the life cycle stages and processes related to a DSF refurbishment. Results show that if on the one hand the life cycle energy balance actually is negative, hence supporting a wider adoption of DSFs in refurbishments, on the other hand there exists ecological and EIs that the DSF bears; that cannot be easily overlooked if a more responsive approach to the EIs is to be undertaken. Not only do these findings inform a more energy-efficient deployment of DSFs, but they also highlight the need for a more holistic and impact-driven design approach to ensure that the environmental burdens are not just shifted from one impact category to another.

Pomponi, F., Piroozfar, P. and Farr, E. (2015) **Double skin façades for the sustainable refurbishment of non-domestic buildings: a life cycle environmental impact perspective** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

Green IT

IMPLEMENTATION OF GREEN ICT APPROACH FOR TRANSFERRING BIG DATA OVER PARALLEL DATA LINK

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Keywords: Big Data, Cloud Computing, Green IT and Transfer Data.

Abstract

The research is related to Big Data transfer over Parallel Data Link and the main objective is to assist the Saint-Petersburg National Research University ITMO research team, and to apply Green IT methods for the data transfer system. The goal of the team is to transfer Big Data by using parallel data links with SDN Openflow approach. My task as a team member was to compare existing data transfer applications in case to verify which results the highest data transfer speed in which occasions and explain the reasons. In the context of the research, a comparison between 5 different utilities has been done, including Fast Data Transfer (FDT), BBCP, BBFTP, GridFTP, and FTS3. A number of scripts were developed which consist of creating random binary data to be incompressible to have fair comparison between utilities, execute the Utilities with specified parameters, create log files, results, system parameters, and plot graphs to compare the results. Transferring such an enormous variety of data can take a long time, and hence, the necessity appears to reduce the energy consumption to make them greener. In the context of Green IT approach, our team used Cloud Computing infrastructure called OpenStack. It is more efficient to allocate specific amount of hardware resources to test different scenarios rather than using the whole resources from our testbed. Testing our implementation with OpenStack infrastructure results that the virtual channel does not consist of any traffic and we can achieve the highest possible throughput. After receiving the final results we are in place to identify which utilities produce faster data transfer in different scenarios with specific TCP parameters and we can use them in real network data links.

Georgiou, S., Shevel, A. and Anagnostopoulos, T. (2015) **Implementation of green ICT approach for transferring big data over parallel data link** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

DEVELOPMENT OF AN ECOLOGY-ORIENTED SDN FRAMEWORK

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Keywords: Software-Defined Network, Green IT, OpenFlow, Energy-Saving.

Abstract

ICT contributed to about 0.83 GtCO₂ emissions where the 37% comes from the telecoms infrastructures. At the same time, the increasing cost of energy has been hindering the industry in providing more affordable services for the users. One of the sources of these problems is said to be the rigidity of the current network infrastructures which limits innovations in the network. SDN (Software Defined Network) has emerged as one of the prominent solutions with its idea of abstraction, visibility, and programmability in the network. Nevertheless, there are still significant efforts needed to actually utilize it to create a more energy and environmentally friendly network. In this paper, we suggested and developed a platform for developing ecology-related SDN applications. The main approach we take in realizing this goal is by maximizing the abstractions provided by OpenFlow and to expose RESTful interfaces to modules which enable energy saving in the network. While OpenFlow is made to be the standard for SDN protocol, there are still some mechanisms not defined in its specification, especially related to energy saving. To solve this, we created REST interfaces for setting of QoS (Quality of Service) in the switches which can maximize network utilization. Interfaces and modules for enabling Adaptive Link Rate are also implemented. The usage of multi paths in a network is evaluated for its benefit in terms of transfer rate improvement and energy savings. Hopefully, the developed framework can be beneficial for other developers in creating applications for supporting environmentally friendly network infrastructures.

Satriana, C., Sadov, O. and Grudin, V. (2015) **Development of an ecology-oriented SDN framework** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

MODELING THE POWER CONSUMPTION OF ETHERNET SWITCH

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Keywords: Green Networking, Power consumption, Design of Experiment

Abstract

At present, one of the main concerns of green network is to minimize the power consumption of network infrastructure. Surveys show that, the highest amount of power is consumed by the network devices during its runtime. However to control this power consumption it is important to know which factors has highest impact on this matter. This paper is focused on the measurement and modeling of the power consumption of an Ethernet switch during its runtime, considering various types of input parameters with all possible combinations. For the experiment, three input parameters are chosen. They are bandwidth, traffic and number of connections. The output to be measured is the power consumption of the Ethernet switch. Due to the uncertain power consuming pattern of the Ethernet switch a fully-comprehensive experimental evaluation would require an unfeasible and cumbersome experimental phase. Because of that, a design of experiment (DoE) method has been applied to obtain adequate information on the effects of each of the input parameters on the power consumption. The whole work consists of three parts. In the first part a test bed is planned with input parameters and the power consumption of the switch is measured. The second part is about generating a mathematical model with the help of design of experiment tools. This model can be used for measuring precise power consumption in different scenarios and also pinpoint the parameters with higher influence in power consumption. And in the last part, the mathematical model is evaluated by comparison with the experimental values.

Hossain, M., Rondeau, E., Georges, J. and Bastogne, T. (2015) **Modelling the power consumption of thernet switch** *In*; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

PHP SINGLE AND DOUBLE QUOTES: DOES IT MAKE A DIFFERENCE TO ENERGY CONSUMPTION

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Keywords: energy, consumption, efficiency, software, application, rules, green, code, programming language, joulemeter.

Abstract

The increasing rate of carbon and other greenhouse gas emission resulting from the use of IT and other human activities to the atmosphere has become a major source of concern. It has become a matter of great importance for the IT sector to put its house in order by ensuring that its products are effective and efficient, and with little or no negative impact to the environment. Effective and efficient products perform all the intended purposes with reduced consumption of energy resources, and thereby having reduced impact on the environment. Reducing energy consumption of IT products is a key to contributing towards a greener environment. In programming or scripting languages, an end result can be achieved in more than one way. For example, in PHP, a print command can be executed using a single quote and can also be achieved using a double quote, with both achieving the same end-results and without affecting the quality of the intended outcomes. This has led to the research on the energy consumption of selected PHP scripts that perform similar functions: print single and double quote; echo single and double quote, etc... The Joulemeter energy measuring tool is used to measure the amount of energy consumed when run the various PHP scripts.

Olaoluwa, P., Kor, A. and Pattinson, C. (2015) **PHP single and double quotes: does it make a difference to energy consumption** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

Policy Change and Energy

THE ROCKY ROAD OF POST-CAPITALIST GRASSROOTS EXPERIMENTATION

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Keywords: Cohousing, UK, transition, post-capitalism, grassroots, experimentation.

Abstract

This paper explores more radical notions of social and ecological transitions beyond life as currently conceived under capitalism. It forms an inquiry into the everyday practices of what is called post-capitalist grassroots experimentation. It explores what these practices mean through an empirical case study of a community-led housing project in the North of England. Drawing on six themes which were derived from in-depth interviews with residents, this paper explores how everyday practices in this project give shape to post-capitalist grassroots experimentation: taking risks, transformational change, a fine grained approach to place making, deepening deliberative democracy, embedding security in insecure times, and learning. By drawing on the concept of the urban commons, the paper concludes by sketching out some future issues along the rocky road to post-capitalism. First, exploring these practices as part of a minoritarian politics focused on qualitative development rather than mere quantitative growth offers different perspectives on scaling up. This kind of prototype niche experiment is more interested in break-out from, rather than breakthrough to, the dominant regime. Second, these practices represent hybrid bottom-up and middle-out forms of experimentation, which can help form novel meso-level institutions to deepen a post-capitalist urban commons. Finally, this kind of grassroots experimentation acts as a reminder of the need for deeper critiques of global capitalist urbanization, and that the broader struggle remains resisting the further embedding of capital accumulation and commodification rather than mere environmental or climate change issues. Drawing on Holloway's (2010) concept of cracks, we can see that the daily practices of niche experiments represent a complex spatial politics of being simultaneously in, against and beyond life under capitalism.

Chatterton, P. (2015) **The rocky road of post-capitalist grassroots experimentation** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

A FIELD TRIAL TO MEASURE ENERGY EFFICIENCY IMPROVEMENTS TO DOMESTIC CENTRAL HEATING USING A DE-AERATOR

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Keywords: de-aerator, degree days, domestic heating system, energy efficiency.

Abstract

A field experiment was undertaken to assess how the efficiency of a dwelling's heating system that changes after installing a de-aerator. There was a large degree of uncertainty regarding the level of internal gains being experienced; however the test showed that efficiency improvements of around 6% may be achieved. It was also observed that the dwelling may have been heated more homogenously after the Oxyrod was installed however this may have been due to the warmer weather experienced.

Data sample size was a fundamental problem, especially in the after test, substantially limiting reduced confidence in the results. Variations in the internal conditions caused by dynamic effects from solar radiation and the heat transfer between upstairs and downstairs and one-off influences such as the broken window as well as researchers entering and altering the test conditions may have been smoothed out and have less influence on the overall data if the sample were larger. It is recommended that future tests should either be run for longer or at greater $\Delta\vartheta$, preferably undertaken during winter periods, in order to generate more and reliable data.

Results were presented using sensitivity analysis to describe the uncertainty. It is recommended that further data be collected to confirm if this finding can be repeated and that future tests directly measure the heat transfer between adjacent spaces using heat flux plates and to measure the solar radiation entering the space. A further simplification could have been achieved by selecting a case study building that was a detached and to provide solar shading which would result in less complicated heat bypasses and solar gains.

Glew, D., Fletcher, M. and Gorse, C. (2015) **A field trial to measure energy efficiency improvements to domestic central heating using a de-aerator** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

AFRICAN ENERGY-PLUS CONSTRUCTION – A CASE STUDY OF HOUSE RHINO

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Keywords: Energy-Plus, renewable energy, alternative construction, sustainable design.

Abstract

Due to the energy crisis that South Africa has experienced over the past seven years, challenging preconceived ideas by creating attractive, affordable, energy efficient buildings has become critical to offsetting massive cost increases for electricity whilst providing a proof of concept project that professionals can reference.

This paper reports on a case study of an energy-plus residential building in South Africa, one of the 1st of this project type on the African continent. House Rhino, located on the outskirts of the south-eastern coastal city of Port Elizabeth, provided an unprecedented opportunity to research the potential for a residential energy-plus building as a proof of concept for a future where energy and water are rare commodities. House Rhino combines active and passive features in a modern residential design that has been created as a living lab. By means of an illustrative case study including site observation, interviews with the project team and analysis of on-site project data, this research has provided a benchmark against which future projects can be measured.

Findings include that an Energy-Plus building can be constructed in a warm climate environment at a competitive price and that residential biogas generation has challenges in production and usage to make it viable. The results of the research suggest that although the benefits of sustainable construction are well known, the ability to create viable Energy-Plus buildings using alternative construction techniques can now be proven in a warm climate environment.

This study reports on a single-case study, which was justified due to its uniqueness (Yin 2014). The project is located in South Africa and its design and choice of construction method challenge standard South African construction techniques whilst incorporating energy and water efficient technologies for an African climate environment – although not without unique (South African) challenges. Its findings are limited to the warm climate as well as to the African construction standards, methods, economy, workforce and workmanship.

Although several studies about Net-Zero Energy Buildings (NZEBS) were conducted in South Africa the authors were not able to find any academic study about Net-Energy-Plus Buildings let alone about residential NZEBs. Research in energy-efficiency construction concentrates on commercial and office buildings in Africa.

Allen, C. and Crafford, K. (2015) **African energy-plus construction – a case study of House Rhino** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

OVERCOMING BARRIERS TO MAKING CITIES MORE SUSTAINABLE: HOW CAN SHORT-TERM THINKING HELP ACHIEVE LONG-TERM GOALS?

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Keywords: Cities, Climate Change, Sustainability, Transition.

Abstract

Cities are critical to addressing sustainable development: over 50% of us live in cities; they consume 75% of global resources, over two thirds of all energy and account for 70% of global CO2 emissions. Cities have responded to this challenge with a large number committing to sustainable visions and/or initiatives such as the C40 Cities Climate Leadership Group or ICLEI Local Governments for Sustainability network. Whilst there are pockets of best practice we are not seeing the speed or scale of change required in terms of resource use, carbon emissions or well-being. Cities are struggling to achieve long-term goals in the face of short-term pressures, capacities and practices such as budgeting, political cycles and procurement approaches. Rapid change and uncertainty, especially in technology, is also a challenge. This paper reviews the transition literature to identify and evaluate how transition theory can be used to understand and overcome this implementation gap. The findings show that the transition management model offers a promising approach but with significant weaknesses and gaps. However these can be addressed by drawing on other theories and models of change. The paper concludes by proposing a new framework for change incorporating short-term processes, demand drivers and evaluation into the transition management model, and proposing areas for research.

Huxley, R. (2015) **Overcoming barriers to making cities more sustainable: how can short term thinking help achieve long term goals?** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

Energy

ECONOMIC ASSESSMENT OF BIOMASS GASIFICATION TECHNOLOGY IN PROVIDING SUSTAINABLE ELECTRICITY IN NIGERIAN RURAL AREAS

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Keywords: Biomass Gasification Technology, Nigeria, Sustainable Electricity, Whole Life Costing.

Abstract

Renewable Energy Technologies (RET) in general, and biomass source in particular, remains one of the means of providing sustainable electricity to rural areas in developing countries. This is because of its strategic value in identifying when and where electricity is really required thus, reducing/eliminating the high cost of grid network. The majority of Nigeria's rural dwellers are farmers and use little or none of their residues at the end of the farming season. Nigeria has also been experiencing dwindling power supply at both national and rural level with accessibility representing only 35% and 10% respectively. The rural areas are the most affected causing significant disruption of their socio-economic settings. Considering the enormous biomass resources in these communities, and they constitute approximately 65% of the country's total population, it is feasible to provide sustainable electricity to these communities through Biomass Gasification Technology (BGT). Cost has been found to be the major constraint in adopting RETs. Hence, this paper aims to evaluate and optimise the unit cost of generating electricity through BGT in Nigerian rural areas. Whole Life Costing approach has been used to evaluate various capacities of BGT. The findings reflect that cost/kW of BGT ranges between US\$594(NGN118, 800)-US\$3,604(NGN720,800) for capacities between 125kW-10kW. The Net Present Value(NPV)/kWh of generating electricity has been calculated for several scenarios including 125kW, 100kW, 50kW, 32kW, 24kW and 10kW system capacities under 3 different operational hours (8, 12 and 16), with and without feed-in tariff(FIT) incentive is from US\$0.015-US\$0.11(NGN3.08–N21.79). The only scenario that exceeds the current unit price of generating electricity from fossil fuel source in Nigeria which is averagely US\$0.083(NGN16.50) is 8 hour operation without FIT at 10kW capacity. More so, in the event fuel wood price increases by 50%, 75% and 100%, the average increase in NPV/kWh will be 13%, 20% and 27% respectively.

Garba, A. and Kisha, M. (2015) **Economica assessment of biomass gasification technology in providing sustainable electricity in Nigerian rural areas** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

THE DEVELOPMENT OF AN ENERGY INDEX TO ASSESS ENERGY REDUCTION

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Keywords: Energy Consumption, Energy Efficiency, Energy Reduction.

Abstract

This short paper presents a methodology to allow the easy comparison of energy consumption between different flats, during different seasons and at different locations, while keeping a low budget perspective for the work. This methodology develops an energy index to normalise and evaluate the heating energy performance of different properties.

The energy index is based on the energy consumption in kWh, internal temperature and outdoor conditions by the use of degree days. Degree days are calculated based on the location of the property and the internal temperature as base temperature for the calculation. The degree days will be generated according to the period for the meter reading, allowing meter reading to be variable in length but it is advisable to do so on roughly four weeks periods. The normalised energy index is finally generated by combining the meter reading in kWh and the degree days for the reading period.

The energy index methodology is applied to four flats located in East Anglia. Results show that the behaviour changing was effective in reducing energy use and allow to understand energy consumption during different seasons and sudden weather changes.

The use of the energy index methodology presented in this paper should allow energy professionals, tenants and social housing providers to monitor and evaluate the energy use across seasons and locations, the effectiveness of new retrofitted technology and/or the application of behaviour change strategies, while keeping a low budget approach to the data captured and analysis

Jimenez-Bescos, C. (2015) **The development of an energy index to assess energy reduction** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

INFRASTRUCTURE INTERACTIONS: THE BUILT ENVIRONMENT AND THE ELECTRICITY NETWORK

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Keywords: infrastructure, electricity, network, graph theory.

Abstract

Electricity infrastructure is considered a critical infrastructure for the UK, vital to economic prosperity. Current and future changes to the built environment, and the way we use electricity, will increasingly impact on local electricity infrastructure. Understanding the interaction between the built environment and electricity infrastructure is the focus of this paper. Infrastructure can be seen as comprising the physical network, carriers, conversion and storage facilities as well as governance, management and control systems needed to meet functional and social objectives. Studies have considered the nature of interdependency between infrastructures to be geographical/spatial, physical, functional, cyber/informational, logical, mutual or shared elements, resources/inputs, policy, market, budgetary and economic. Infrastructure can be represented using graph, or network, models. A node, or vertex, represents a physical element of the infrastructure, connected to one another by edges. Graph models have been used previously to consider, for example, disruption to resource flows as a result of natural hazard damage, interdependencies between gas and electricity infrastructure, and vulnerability of electricity infrastructure. Building on this previous work, graph theory is used to analyse the interaction between the built environment and the electricity infrastructure when considering the impact of energy efficiency retrofit of domestic properties. These interactions are identified through interviews with energy efficiency retrofit stakeholders. These interactions are then represented in a simple graph theory model.

Walker, S. (2015) **Infrastructure interactions: the built environment and the electricity network** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

OFF THE SHELF SOLUTIONS TO THE RETROFIT CHALLENGE: THERMAL PERFORMANCE

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Keywords: building performance, full scale test facility, off the shelf solutions, retrofit.

Abstract

The potential to reduce energy demand and carbon emissions from the built environment is considerable. As well as benefitting the environment, good energy efficient retrofits should improve thermal comfort, reduce energy bills and add value; however, the discrepancy between expected and actual performance can be a concern. While the vast majority of the 26 million homes in the UK are suitable for energy efficiency upgrades, few have been retrofitted to standards that could be considered commensurate with the legislated nearly zero target. If thermal upgrades are to be accepted and adopted the retrofit solutions should be simple and effective, delivering the performance expected. The research presented is part of an intensive two stage research project commissioned by Saint-Gobain, undertaken at the Salford Energy House, with teams from Leeds Beckett University and the University of Salford. The work reports the first phase of testing the thermal performance of an end-terrace house situated in an environmentally controlled chamber prior to and post retrofit, using 'off-the-shelf' products. The programme examined the thermal performance of retrofit upgrades and explored, in detail, the building's behaviour at an elemental and whole building scale. Each of the whole building tests were undertaken from a consistent test baseline performed under the same conditions. The results demonstrate a 63% reduction in the heat loss coefficient, more stable indoor climate and significantly reduced air leakage. As the initial building, pre-retrofit, would be considered a well-appointed and maintained example of a Victorian property, the potential thermal and comfort improvements in the field could be much greater. The research findings are presented and discussed in detail. The initial results are considered to be achievable in the field and the results of the second stage, not reported here, suggest the potential for even greater savings using readily available retrofit approaches (75% reduction achieved during initial tests).

Farmer, D., Gorse, C., Miles-Shenton, D., Brook-Peat, M., and Cuttle, C. (2015) **Off the shelf solutions to the retrofit challenge: thermal performance and comfort** In; Gorse, C and Dastbaz, M (Eds) *International SEEDS Conference*, 17 – 18 September 2015, Leeds Beckett University UK, Sustainable Ecological Engineering Design for Society.

Change

THE REJUVENATION OF A HISTORICAL NEIGHBOURHOOD IN SOUTH AFRICA

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Keywords: Decay, Neighbourhood, Rejuvenation.

Abstract

In South Africa, many cities have retrogressed over the years. Disinvestment in the inner cities and the flight to suburbs in the eighties and early nineties by business and retail was propelled by the manifestation of deteriorated buildings, an increase in slums and crime, and a shabby, poorly managed urban environment. Central Hill, Port Elizabeth, as in many other cities in South Africa, was unable to escape this phenomenon. There have been efforts to revive the area abounding the central business district (CBD), however, those efforts have often overpowered by the overwhelming challenges that are associated with Central Hill, such as a lack of resources, the prevalence of drugs, prostitution and general crime.

Twenty interviews were conducted with individuals from different backgrounds both professionally and socially to determine the challenges faced by Central Hill, the causes of the challenges, and possibly, a solution to the challenges. These included residents, business people, built environment professionals, and property developers closely affiliated with Central Hill.

The salient findings show that drugs, prostitution, poorly managed buildings by both landlords and residents, security and crime, are major challenges in Central Hill. Conclusions include that there is a need for a new meaning, plan, and vision for Central Hill that it can be identified with, and carried forward.

Recommendations include the development of a strategic plan incorporating all stakeholders to carry the vision of a rejuvenated Central Hill forward, in addition to interventions such as law enforcement, and incentives for landlords.

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SMART BADGE FOR MONITORING FORMALDEHYDE EXPOSURE CONCENTRATION

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Keywords: Air quality, smart sensor, personal exposure concentration, formaldehyde.

Abstract

Formaldehyde is used by many industrial processes (e.g., paper, wood, textile). The World Health Organization classifies formaldehyde in the category 3 of carcinogenic substances and defines exposure limits in professional context. The objective of CAPFEIN project funded by the French National Research Agency is to develop smart systems to estimate formaldehyde exposure concentrations of employers working in a closed environment. This research project gathering researchers in chemistry and information and communication technologies is composed of three parts: the development of sensor measuring indoor formaldehyde concentrations, the implementation of indoor positioning systems and the design of smart communication systems capable of calculating personal exposure concentrations from formaldehyde sensor and tracking system. Different solutions were investigated based on centralized or distributed approaches. In this paper, only the latter is described and focused on the development of a smart badge. The employer wears a badge embedding (1) infrared interface for communicating with the positioning system, (2) Wifi interface for collecting data from formaldehyde sensors, for displaying information on employer's mobile phone, etc. (3) processor for offering users' services and algorithms to estimate personal exposure concentration and (4) memory for locally storing the history of formaldehyde exposure. The specific issue discussed in this paper is about the amount of memory and energy required to store and process historic data on the badge. The method tested in this paper is EWMA (Exponential Weighted Moving Average). EWMA method is implemented in a badge prototype and assessed. It shows a significant reduction of memory and computation costs, and consequently energy consumption. Besides, the badge designed in CAPFEIN project is generic and can be used for other air pollutants. In addition, the optimization of memory space, processing time and energy consumption based on EWMA method allows the badge to manage several air pollutant sensors.

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THE INFLUENCE OF LANDSCAPE ARCHITECTURE ON LANDSCAPE CONSTRUCTION HEALTH AND SAFETY (H&S)

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Keywords: Construction, Health and Safety, Influence, Landscape Architects.

Abstract

The influence of design on construction H&S is well documented in literature, as the concept and practice of 'designing for construction H&S'. However, there is a paucity of literature relative to landscape construction H&S and none relative to the influence of landscape architecture on landscape construction H&S. Furthermore, no research has been conducted relative to the aforementioned, despite landscape construction entailing exposure to numerous hazards and risks.

Given the aforementioned, a quantitative study was conducted among members of the Institute of Landscape Architects South Africa (ILASA), the objectives of the study being to determine, among other purposes, the perceptions and practices of landscape architects relative to landscape construction H&S.

The salient findings include: site handover, site meetings, and site inspections / discussions predominate in terms of the frequency landscape construction H&S is considered / referred to on various occasions; method of fixing predominates in terms of the frequency construction H&S is considered / referred to relative to design related aspects; position of components predominates in terms of the extent design related aspects impact on landscape construction H&S; tertiary landscape architecture education addresses landscape construction H&S to a minor extent; respondents rate their knowledge of landscape construction H&S and 'design for landscape construction H&S' skills as poor, and experience predominates in terms of respondents' acquisition of knowledge of landscape construction H&S.

Conclusions include: landscape construction H&S is considered / referred to on various occasions and relative to design related aspects to a degree; there is a degree of appreciation in terms of the extent design related aspects impact on landscape construction H&S, and landscape architectural programmes address landscape construction H&S to a limited extent.

Recommendations include: tertiary education landscape architectural programmes should include appropriate 'designing for landscape construction H&S' modules as a component of a subject – probably design. The ILASA should develop practice notes relative to landscape construction H&S, and the South African Council for the Landscape Architectural Profession (SACLAP) should include construction H&S in their six work stages (IoW) in a more comprehensive manner.

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SWITCH, DON'T SAVE

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Keywords: occupant behaviour, thermal comfort, energy use, qualitative research, discursive strategies.

Abstract

Efforts to meet targets on carbon emission and to reduce the number of people in fuel poverty often focus on building new highly energy efficient homes and retrofitting existing ones. However, as occupant behaviour is a major predictor of energy use, it is also valuable to provide interventions that help occupants to use less energy. Here we report qualitative research with 26 occupants in homes retrofitted with External Wall Insulation and ask what influences the actions they take to reduce the energy they use.

Semi-structured interviews, lasting up to one hour, were audio recorded and transcribed verbatim. Taking a social constructionist paradigm we used a discursive approach to analyse the ways in which people construct and represent their energy consumption and the discursive practices they employ to legitimise their actions or inactions.

We identified two main discourses. The dominant discourse positions savvy and responsible consumers as those who switch suppliers to obtain the best energy deals, thereby saving money and enabling them to enjoy a warm and comfortable home. Making efforts to use less energy did not feature in this discourse. Participants' talk was of disappointment and betrayal when the anticipated savings did not materialise. They blamed suppliers and usually switched again. An alternative discourse, of changing behaviour to reduce energy use was drawn upon less often. When present, it accompanied other life events, such as moving home, a change in work status, or a period of illness. Talk centred on trying to offset the increasing cost of energy, with the purpose of reducing energy bills rather than using less energy. Protecting the environment was not a feature of this discourse.

We conclude that campaigns that encourage consumers to switch energy providers have the potential to adversely affect interventions to help them reduce the energy they use.

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